REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1, 3-9, 11-17 and 19-21 are pending in the present application. Claims 1, 9, 17 and 21 were amended and Claims 2, 10 and 18 were cancelled by the present amendment. Support for amendments to the claims can be found in the claims as originally filed and, at least, on page 10, lines 19-25. Thus, no new matter is added.

In the outstanding Office Action, Claims 5 and 13 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement; Claims 1-4, 7, 9-12, 15 and 17-21 were rejected under 35 U.S.C. §102(e) as anticipated by Taniguchi (U.S. Pat. No. 6,456,730); Claims 8 and 16 were rejected under 35 U.S.C. §103(a) as unpatentable over Tanighchi in view of Ishii et al. (U.S. Pat. No. 6,993,159, herein "Ishii"); and Claims 6 and 14 were objected to a dependent on a rejected based claim but would be allowable if rewritten in independent form including all of the features of the base claim and any intervening claims.

Initially, Applicants gratefully acknowledge the early indication of the allowable subject matter in Claims 6 and 14. However, since Applicants consider that Claims 1 and 9 patentably define over the cited art, Claims 6 and 14 have presently been maintained in dependent form.

With regard to the rejection of Claims 5 and 13 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, Applicants respectfully traverse this rejection. Specifically, Applicants respectfully submit that the feature "a trajectory of the obstacle candidate area tracked over the plurality of frame images is not smooth" recited in Claims 5 and 13 is supported at least by the phase "when the motion differs greatly from uniform motion" found on page 9, lines 1-2 of the originally filed disclosure. Accordingly,

Applicants respectfully request that the rejection of Claims 5 and 13 under 35 U.S.C. §112, first paragraph, be withdrawn.

Addressing now the rejection of Claims 1-4, 7, 9-12, 15 and 17-21 under 35 U.S.C. §102(e) as anticipated by Taniguchi, Applicants respectfully traverse this rejection.

Amended Claim 17 recites, in part,

> inputting a plurality of frame images serving as video images;
>
> detecting, from each frame image in the plurality of frame images, a straight-line component in a horizontal direction in the frame image;
>
> generating an obstacle candidate area as an image area in a vicinity of the detected straight-line component;
>
> tracking the obstacle candidate area in an image succeeding each frame image in the plurality of frame images, and producing a tracking result for the obstacle candidate area;
>
> determining, using the tracking result of three or more obstacle candidate areas, whether the three or more obstacle candidate areas belong to a plane extending in a specific direction in a three dimensional space, and producing a determination result; and
>
> detecting an obstacle based on the determination result.

Claims 1 and 9 recite corresponding means and apparatus claims, respectively and Claim 21 recites similar features with regard to the straight-line component and the plane extending in a specific direction in a three dimensional space.

Taniguchi describes a technique for detecting moving objects by tracking motion of small areas in an image and determining a bundle of these small areas which have similar motion. In addition, Taniguchi describes excluding small areas having slow motion,[1] extracting small areas having similar motion using a histogram[2] and detecting a bundle of the extracted small areas as a moving object.[3]

However, Taniguchi does not describe or suggest detecting, from each frame image in the plurality of frame images, a straight-line component in a horizontal direction in the frame

[1] Taniguchi, col. 7, lines 45-47
[2] Taniguchi, col. 7, line 53 to col. 8, line 13
[3] Taniguchi, col. 8, lines 10-20.

image or determining, using the tracking result of three or more obstacle candidate areas, whether the three or more obstacle candidate areas belong to a plane extending in a specific direction in a three dimensional space, as is recited in Claim 17.

The outstanding Action states on page 3 that Taniguchi describes detecting the straight line in Figs. 3-7 and col. 4, lines 45-57. However, Applicants note that although Taniguchi describes detecting white lines on the road surface, Taniguchi fails to describe or suggest detecting a horizontal line ***from the captured frame image***.

In addition, Taniguchi fails to describe determining, using the tracking result of three or more obstacle candidate areas, whether the three or more obstacle candidate areas belong to a plane extending in a specific direction in a three dimensional space, or in other words, determining whether the moving object belongs to a vertical plane (obstacle) or to a horizontal plane (road surface) in a 3D space.

Accordingly, Applicants respectfully submit that Claim 17 and similarly Claims 1, 9 and 21 patentably distinguish over Taniguchi.

In addition, with regard to the further cited Ishii reference, Applicants respectfully submit that this reference does not cure the above noted deficiencies of Taniguchi with regard to the claimed invention.

Specifically, Ishii describes a technique in which an area in an image having a motion vector in common with an object that was detected as moving is grouped and detected as a moving object. However, the technique of Ishii has a problem in that it cannot detect the object's contact point with a ground surface when the moving object moves out of the image.

In contrast, in the claimed invention, an obstacle is detected on the basis of whether a motion of the small areas (candidate area group) in an image fits to the road surface or to the vertical plane. For instance, in a non-limiting example, Figure 4 shows an example of the horizontal lines recited in the independent claims. In addition, when using the claimed

configuration, a ground line of the vehicle can still be estimated even when a vehicle has moved out of the image.[4]

Thus, Ishii does not describe or suggest detecting, from each frame image in the plurality of frame images, a straight-line component in a horizontal direction in the frame image or determining, using the tracking result of three or more obstacle candidate areas, whether the three or more obstacle candidate areas belong to a plane extending in a specific direction in a three dimensional space, as is recited in Claim 17 and similarly recited in Claims 1, 9 and 21.

Accordingly, Applicants respectfully submit that Claims 1, 9, 17 and 21, and claims depending therefrom, patentably distinguish over Taniguchi and Ishii considered individually or in combination.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 1, 3-9, 11-17 and 19-21, as amended, is patentably distinguishing over the cited art. The present application is therefore believed to be in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully submitted,

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[4] See page 12, line 10 to page 13, line 2 of the claimed invention.